



Department of Transportation
Federal Aviation Administration
Aircraft Certification Service
Washington, D.C.

TSO-C179a

Effective
Date: 04/19/11

Technical Standard Order

Subject: Permanently Installed Rechargeable Lithium Cells, Batteries and Battery Systems

1. **PURPOSE.** This technical standard order (TSO) is for manufacturers and designers of permanently installed rechargeable lithium cells, batteries and battery systems applying for a TSO authorization (TSOA) or letter of design approval (LODA). In it, we (the Federal Aviation Administration or FAA) tell you what minimum performance standards (MPS) your lithium cells, batteries and battery systems must first meet for approval and identification with the applicable TSO marking.

2. **APPLICABILITY.** This TSO affects new applications submitted after its effective date.

a. All prior revisions to this TSO are no longer effective. Generally, we will not accept applications for the previous revision after the effective date of this TSO. We may do so, however, up to six months after it, if we know that you were working against the prior MPS before the new change became effective.

b. *Rechargeable lithium cells and lithium batteries* approved under a previous TSOA may still be manufactured under the provisions of its original approval.

3. **REQUIREMENTS.** New models of permanently installed rechargeable lithium cells, batteries and battery systems manufactured on or after the effective date of this TSO must meet the minimum operating performance standards (MPS) tests based on the intended application defined in the TSO installation manual, in *Sections 2 and 3 of RTCA/DO-311, Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems* dated March 13, 2008. Refer to Table 4-1 of DO-311 for test schedule information.

a. **Functionality.** This TSO's standards apply to permanently installed rechargeable lithium cells, batteries and lithium battery systems intended to provide power for aircraft equipment.

b. Failure Condition Classification. Failure of the function defined in paragraphs 3 and 3a of this TSO is a *major* failure condition. You must develop lithium cells, batteries and battery systems to, at least, the design assurance level equal to this failure condition classification.

c. Functional Qualification. Demonstrate the required performance under the Acceptance Test Procedure in Section 2.3 of RTCA/DO-311, *Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems* document dated March 13, 2008

d. Environmental Qualification. Test the equipment according to Section 3 of RTCA/DO-311, *Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems* document dated March 13, 2008

e. Software Qualification. If the article includes software, develop the software according to RTCA, Inc. document RTCA/DO-178B, *Software Considerations in Airborne Systems and Equipment Certification*, dated December 1, 1992. The software design assurance level should be consistent with the failure condition classification defined in paragraph 3b of this TSO.

f. Electronic Hardware Qualification. If the article includes a complex custom micro-coded component, develop the component to the guidance in FAA Advisory Circular (AC) 20-152, RTCA, Inc. Document RTCA/DO-254, *Design Assurance Guidance for Airborne Electronic Hardware*, dated April 19, 2000. The hardware design assurance level should be consistent with the failure condition classification determined in paragraph 3b of this TSO.

g. Deviations. We have provisions for using alternate or equivalent means of compliance to the criteria in the MPS of this TSO. If you invoke these provisions, you must show that your equipment maintains an equivalent level of safety. Apply for a deviation under 14 CFR 21 Subpart O before submitting your data package.

4. MARKING. Mark each cell battery or battery system permanently and legibly with all the information in 14 CFR 21.Subpart O and Section 1.9.7 of RTCA-DO-311, *Minimum Operational Performance Standards for Rechargeable Lithium Battery Systems* document dated March 13, 2008

5. APPLICATION DATA REQUIREMENTS. Under 14 CFR 21.Subpart O as a manufacturer-applicant, you must give the FAA's aircraft certification office (ACO) manager responsible for your facilities, one copy each of the following technical data to support our design and production approval:

a. Operating instructions and equipment limitations in an installation/instruction manual (IM), sufficient to describe the cell or battery's operational capability. Describe any deviations in detail. If needed, identify the cell or battery by part number, version, revision, and criticality level of software/hardware, classification for use, and environmental categories.

b. Installation procedures and limitations in an IM, sufficient to ensure that the cells, batteries or battery systems, when installed according to the installation procedures, still meet this TSO's

requirements. The limitations must identify any unique aspects of the installation. Finally, the limitations must include a note with the following statement:

The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements.

- c. Schematic drawings of the installation procedures.
- d. Wiring diagrams of the installation procedures.
- e. List of components, by part number, that make up the lithium cells, batteries and battery systems complying with the standards in this TSO. Include vendor part number cross-references, when applicable.
- f. A component maintenance manual (CMM), covering periodic maintenance, calibration, and repair, for the continued airworthiness of installed lithium cells, batteries and battery systems. Include recommended inspection intervals and service life. Describe the details of deviations granted, as noted in paragraph 5a of this TSO.
- g. Material and process specifications list.
- h. The quality system description required by 14 CFR 21 Subpart O including functional test specifications. The quality system should ensure that you will detect any change to the cell, battery or battery system that could adversely affect compliance with the TSO MPS, and reject the item accordingly. (Not required for LODA applicants.)
- i. Manufacturer's TSO qualification test report.
- j. Nameplate drawing with the information required by paragraph 4 of this TSO.
- k. List of all drawings and processes (including revision level), to define the article's design.
- l. An environmental qualifications form as described in RTCA/DO-160F, Environmental Conditions and Test Procedure for Airborne Equipment, for each component of the system.

6. MANUFACTURER DATA REQUIREMENTS. Besides the data given directly to the FAA, a manufacturer must have the following technical data available for review by the responsible ACO:

- a. The functional qualification specifications for qualifying each production article to ensure compliance with this TSO.
- b. Equipment calibration procedures.
- c. Corrective maintenance procedures within 12 months after TSO authorization.
- d. Schematic drawings.
- e. Wiring diagrams.
- f. Material and process specifications.
- g. The results of the environmental qualification tests conducted per RTCA/DO-160F or the most current revision.

7. **FURNISHED DATA REQUIREMENTS.** If furnishing one or more articles to one entity (such as an operator or repair station), provide one copy of the data in paragraphs **5a** through **5g** of this TSO for each article manufactured under this TSO.

8. **HOW TO GET REFERENCED DOCUMENTS.**

a. Order RTCA documents from RTCA Inc., 1828 L Street, N.W., Suite 805, Washington, DC 20036-4001. Telephone (202) 833-9339, fax (202) 833-9434. You can also order copies from the RTCA Internet website at www.rtca.org.

b. Order copies of 14 CFR part 21 from the Superintendent of Documents, Government Printing Office, P.O. Box 371954, Pittsburgh PA 15250-7954. Telephone (202) 512-1800, fax (202) 512-2250. You can also order copies from the Government Printing Office (GPO) Internet website at www.access.gpo.gov. Select "Access," then "Online Bookstore." Select "Aviation," then scroll to "Code of Federal Regulations."

c. You can find a current list of technical standard orders on the FAA Internet website Regulatory and Guidance Library at www.airweb.faa.gov/rgl. You will also find the TSO Index of Articles at the same site.



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